Clark Fork Geographic Information System

Products and Services Guide

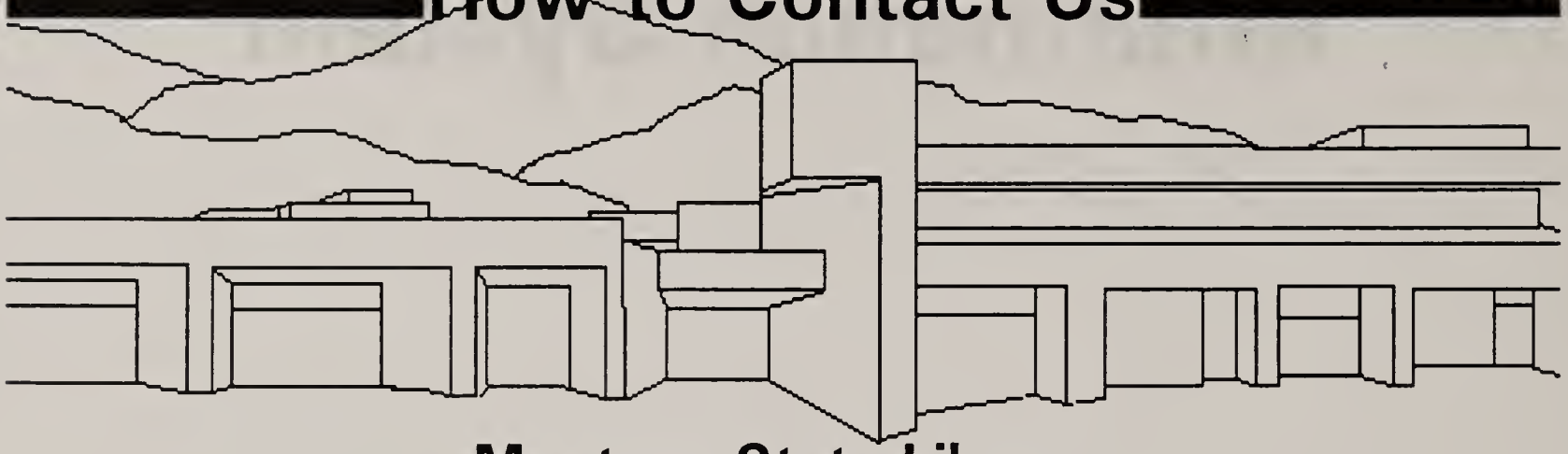
Montana State Library
NRIS Natural Resource Information System
Map #93msl3-00 - 7/19/93

Clark Fork Geographic Information System

PRODUCTS AND SERVICES GUIDE

Montana Natural Resource Information System

How to Contact Us



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INTRODUCTION

The Clark Fork Geographic Information System (CFGIS) was established in the Fall of 1987 as a component of the Montana Natural Resource Information System (NRIS) through an interagency agreement between NRIS and the Montana Department of Health and Environmental Sciences (DHES). The CFGIS was created to support the U.S. Environmental Protection Agency's (EPA) Superfund clean-up of the Clark Fork River Basin.

Since its inception the CFGIS has strived to provide access to Geographic Information System (GIS) technology and make spatial information readily available to all participants in the remediation of the Upper Clark Fork basin in the most useful format possible. The mandate of NRIS is to "make sources of data and information about Montana's natural resources easily and readily accessible." The GIS program accomplishes this goal by promoting GIS technology as a powerful and efficient way of accessing natural resource data.

Implementing GIS technology takes a large investment in time and money; GIS software is complex, requires specialized training to use, and the required hardware is expensive. NRIS mitigates these obstacles for organizations by providing access to GIS technology through highly trained personnel. By using NRIS, organizations can take advantage of a powerful, mature GIS without incurring the full costs of system implementation.

The CFGIS provides all participants in the remediation of the Clark Fork Superfund sites a single contact for acquiring data, reports, analysis, and technical assistance in the use of the vast amount of spatial data that are created as a result of the remediation process.

At NRIS we feel that by promoting cooperation among GIS users in Montana, and by promoting an increased level of knowledge about GIS, all users of GIS in Montana benefit. We pursue this goal by participating with several organizations active in GIS issues in Montana. Groups NRIS works with include the Clark Fork GIS Technical Working Group (CFTWG), the Montana GIS Technical Working Group (TWG), and the Montana GIS Users Group. The CFTWG promotes GIS data standards and sets direction for the CFGIS. The TWG develops standards relevant to GIS, promotes cooperative GIS projects, and provides a mechanism for communication about GIS initiatives. The Montana GIS Users Group sponsors an annual GIS conference where all GIS users in Montana can get together and learn about others' projects and new technology. The Users Group also sponsors publication of the *Montana GIS News*, a quarterly publication featuring projects and activities that affect GIS users in Montana.

Montana Natural Resource Information System

WHAT IS GIS?

Geographic Information Systems (GIS) are defined in different ways because they take different forms to meet the requirements of their users. Essentially a GIS is a data management system that has specialized capabilities for capturing, managing, analyzing, and displaying data that have a spatial or geographic component. These capabilities include the ability to generate graphic reports (maps) and tabular reports; manipulate coordinate systems; integrate data from different sources using coordinates as the common element; perform statistical analysis; and many other types of sophisticated manipulations. Components of a GIS include the data used by the GIS software; the hardware and software needed to input, manipulate, and output data from the GIS; and the personnel capable of combining all the components of the GIS to produce information in a meaningful manner.

The use of GIS technology requires significant amounts of specialized training in geographic principles, computer science, and the specific environment in which a GIS is implemented. The model for the CFGIS is a "service bureau" approach where in managers and scientists have access to a GIS though the GIS staff. This model allows system users to access a powerful GIS system without spending significant amounts of time and effort acquiring the expertise needed to operate the system.

The power of a GIS resides in the spatial component of the data used in the system. This locational information allows the integration and analysis of data in ways that were difficult and time-consuming before the advent of GIS. One example of a GIS application CFGIS users might perform would be to combine demographic data from the U.S. Census Bureau with data collected as part of the remediation process to determine the population under age 18 affected by a specific contaminant. An example of a GIS application that has been performed for CFGIS users is calculating the volume of an area that would be removed under different remediation scenarios (the accuracy of this type of analysis is highly dependent on data quality and other factors and therefore may not be appropriate for precise calculations). However, it is an excellent tool for planning purposes. In the latter example the GIS could also be used for visualizing the topography after remediation.

MAPS

Standard Map Products

The CFGIS has a large number of standard map products available to system users. Standard maps usually have significant use to a wide variety of system users. Standard map products can be provided to users quickly because they require minimal effort to recreate after initial development. Standard maps can also be used as a starting point for creating custom maps.

Base Map Series

Maps based on recent aerial photography are available for all of the Clark Fork Superfund site areas. Features shown on the basemaps include roads, trails, alleys, contours, surface water, buildings, trees, wooded areas, utility poles, and miscellaneous structures. *Figure 1 depicts the areas covered by the aerial photography, dates areas were flown, source scale, and contour intervals. Figure 2 depicts sample basemap data at a scale of 1" = 200'.*

Available Basemaps

Butte Basemaps
The Butte Basemap series is composed of 41 maps at a scale of 1:2400. *Figure 3 is the index for the Butte Basemaps.*

Clark Fork Basemaps
The Clark Fork Basemap Series is composed of 32 maps at a scale of 1:4800. *Figure 4 shows the index for the Clark Fork Basemaps.*

Silver Bow Creek Basemaps
The Silver Bow Creek Basemap Series is composed of 5 maps at a scale of 1:9000. *Figure 5 is the index for the Silver Bow Creek Basemaps.*

Milltown Basemap
There is a one-sheet basemap for the Milltown area at a scale of 1:2400.

Anaconda Basemap
The Anaconda Basemap Series has not been developed as of July 1, 1993.

Other Map Products

Map design in a GIS environment can be a laborious, time-consuming process. Many hours may be spent in the design of even a "simple" cartographic product. However, once the original design work is complete, the maps can be reproduced with little effort. Also, slight variations of existing maps are usually not difficult to produce. Since its inception, there have been hundreds of maps created for users of the CFGIS. These maps are available to all system users.

Samples of new map products are being disseminated to CFGIS users on a quarterly basis. If you see an existing map that would be useful, contact NRIS with the map request number found in the legend area. Or if you don't know the map number we can usually determine it for you based on a description of the map.

Operable Unit Status Maps

The Operable Unit Status maps are 8.5" x 11" maps which show the current level of clean-up at the Clark Fork River Superfund Sites. They may be reproduced at larger sizes for public meetings. There are eight classes of clean-up actions displayed on the maps, ranging from Time Critical Removal Underway to Remedial Action Complete. The status maps are updated as required.

Historically there were four Operable Unit Status maps showing Butte, Anaconda, Milltown, and a Project-wide overview. Recently however, the status map series has been expanded to include Silver Bow Creek, Lower Area One, Rocker, Anaconda Old Works, Anaconda Smelter, and Warm Springs Pond.

Figure 6 is the Butte Operable Unit map.

Facility Location Maps

The Facility Location Maps were originally developed in April of 1992 to show approximate locations of contamination source areas and facilities in the Butte Priority Soils Operable Unit. The maps are updated on an annual basis to show ongoing reclamation and are available in two formats. The first format is a small-scale map showing the entire Butte Priority Soils Operable Unit on one map; the second is a larger scale, separated into four map sheets.

Figure 7 shows a sample area from the Facility Location Maps and Figure 8 is the legend key.

Figure 1

Index to Large Scale Photogrammetric Data

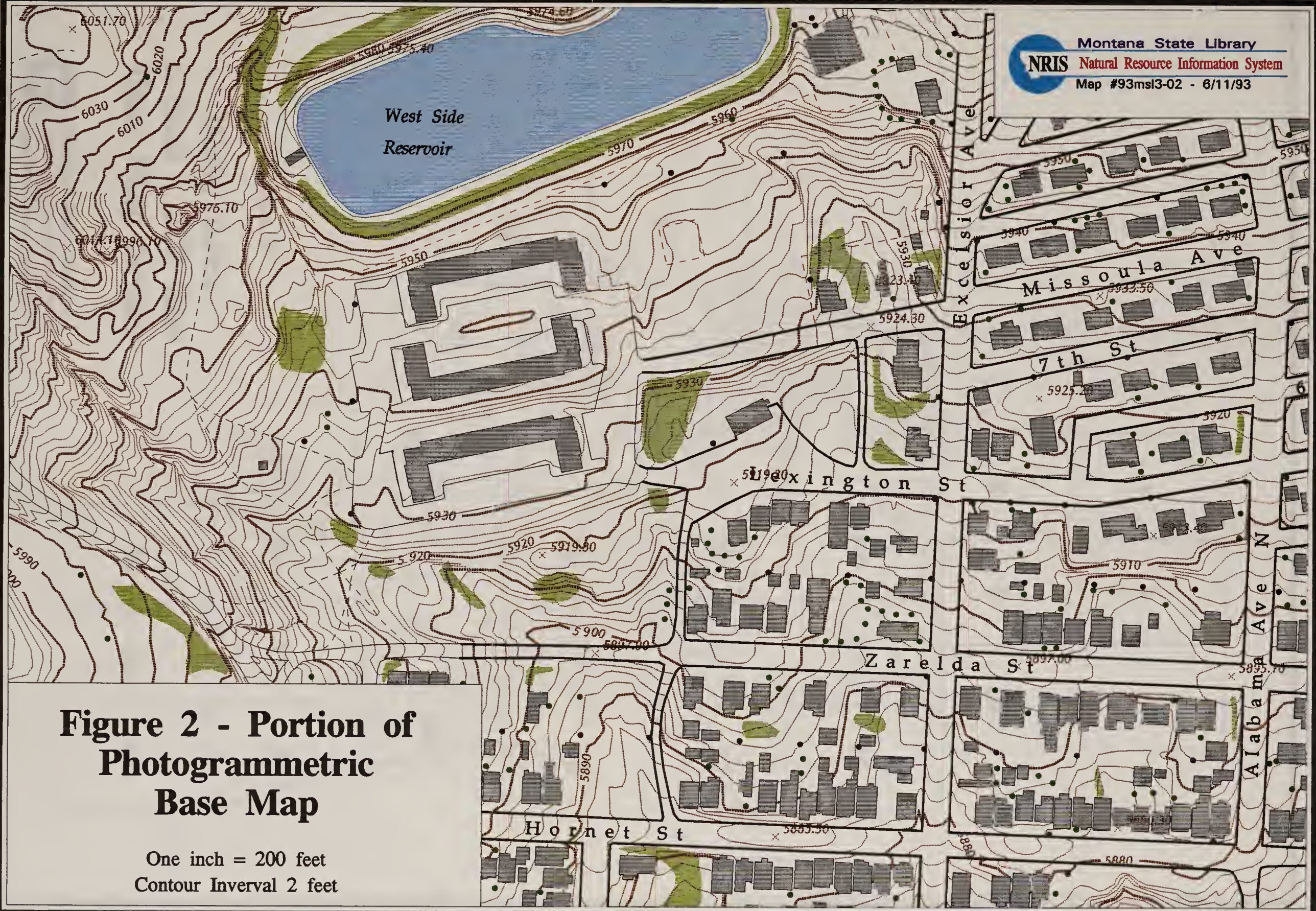

Figure 2 - Portion of Photogrammetric Base Map

One inch = 200 feet
Contour Inverval 2 feet

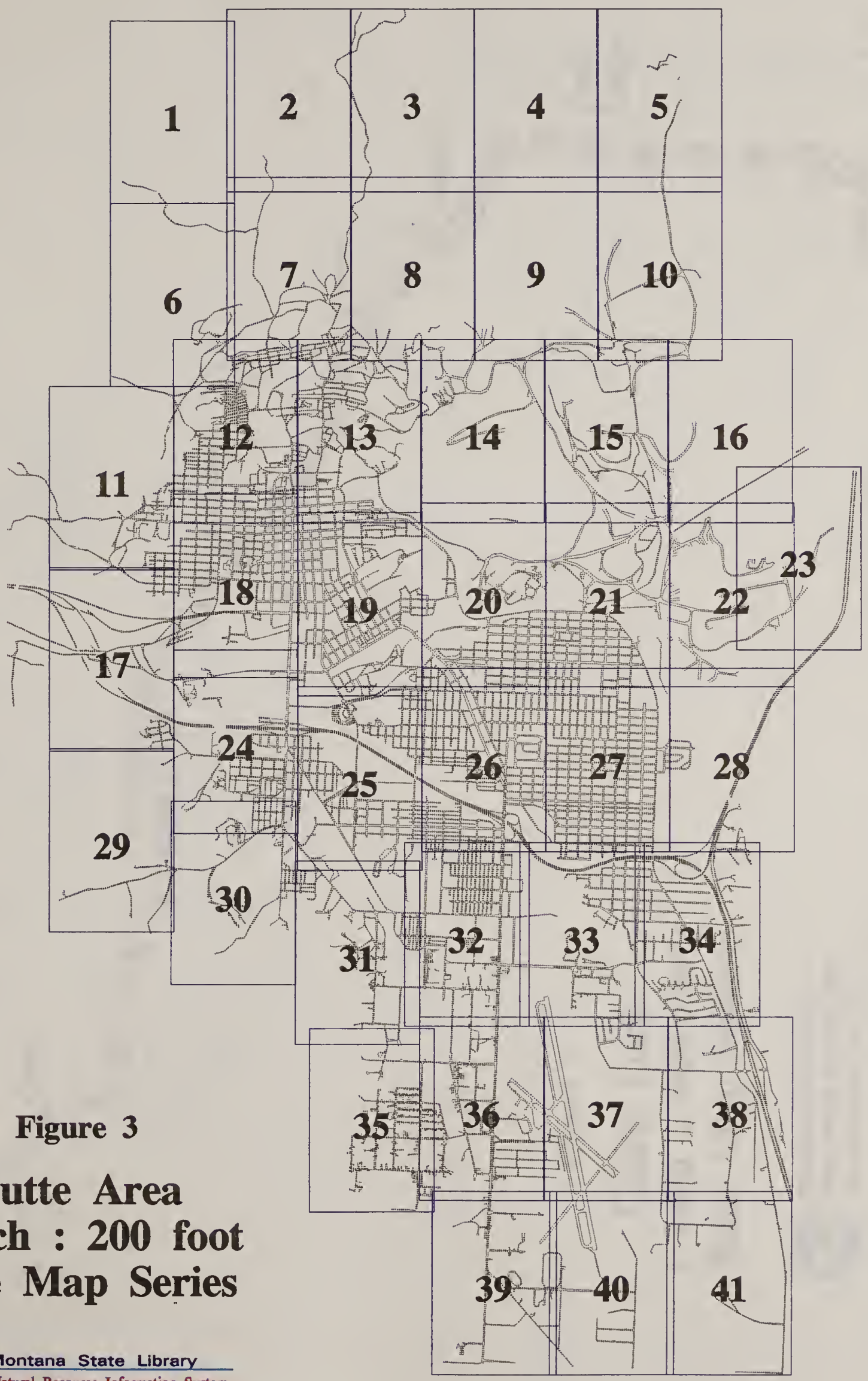

Figure 3

Butte Area
1 inch : 200 foot
Base Map Series

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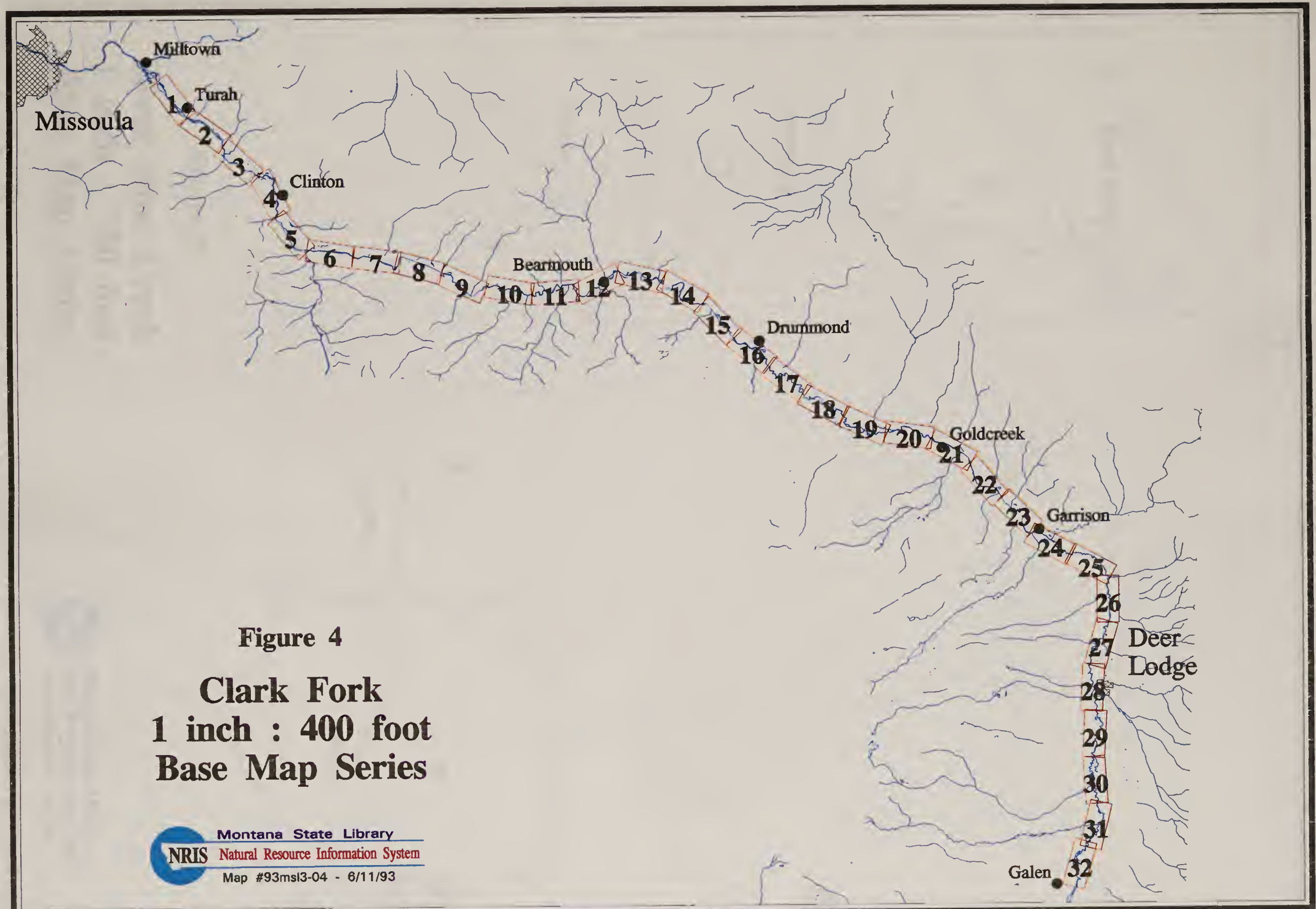

Figure 4

Clark Fork
1 inch : 400 foot
Base Map Series

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NRIS Natural Resource Information System
Map #93msl3-04 - 6/11/93

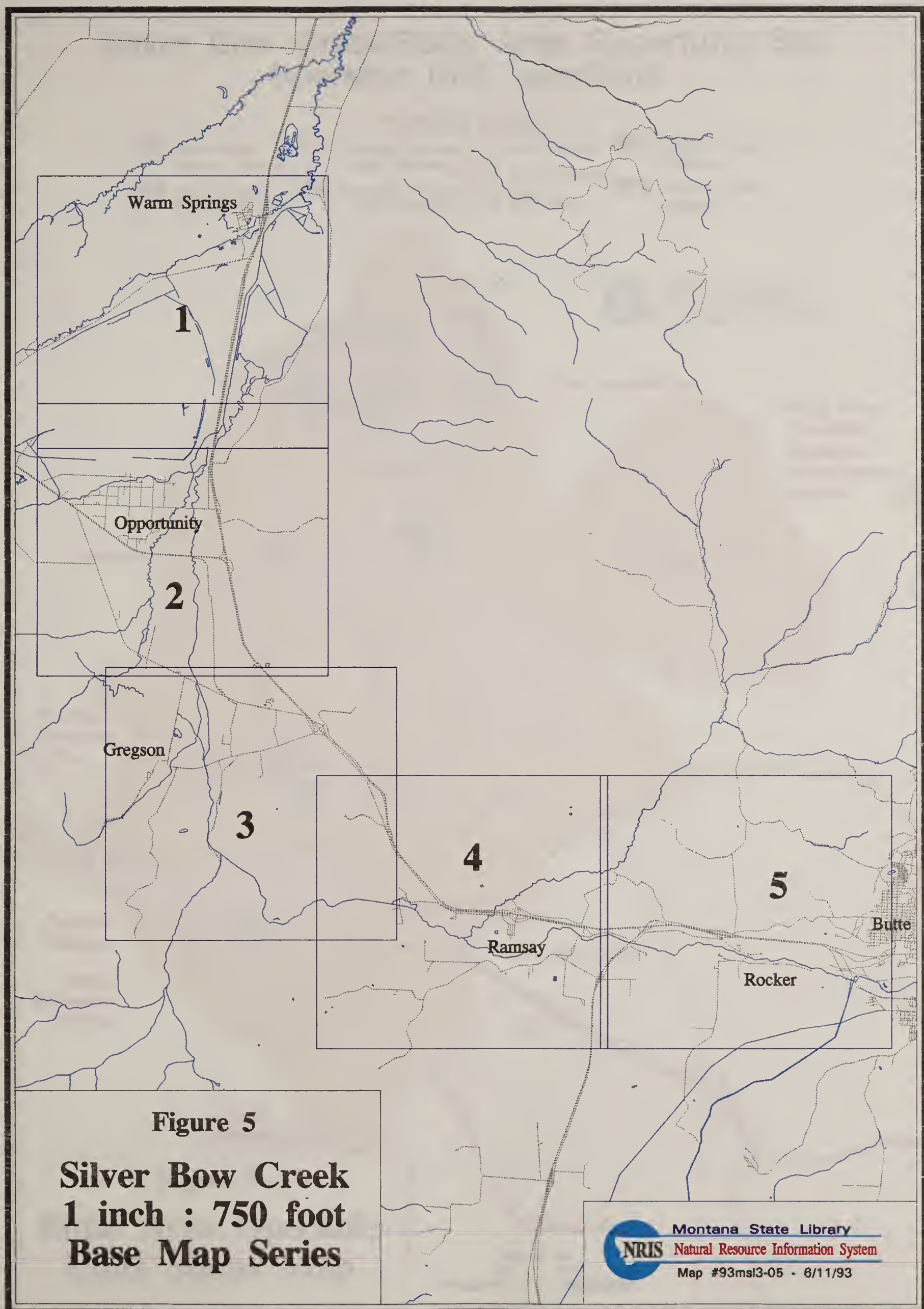

Figure 5

Silver Bow Creek
1 inch : 750 foot
Base Map Series

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NRIS Natural Resource Information System
Map #93msl3-05 - 6/11/93

Silver Bow Creek/Butte Area Superfund Site
Operable Unit Locations

Activities Legend

- Time Critical Removal Underway
- Time Critical Removal Complete
- Expedited Response Action Underway
- Expedited Response Action Complete
- RI/FS Scoping
- RI/FS Underway
- ROD Signed
- Remedial Action Underway
- Remedial Action Complete

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Map #93msl3-06 - 6/11/93

Walkerville
Daly St
Centerville
Late Acquisition
Butte Mine Flooding (includes underground mines)
Anselmo
Main St
Berkeley Pit
Park St
Excelsior Ave
Montana Ave
Travona Flooding
Iron St
Continental Drive
Front St
Centennial Ave
Harrison Ave
Colorado Tailings
Lower Area One
Butte Reduction Works
Montana Pole NPL Site
90
15
Rowe Road
Clark Tailings
Holmes Ave

Scale of Feet
0 1500 3000 4500

Figure 6

Butte Area Operable Units Status Map

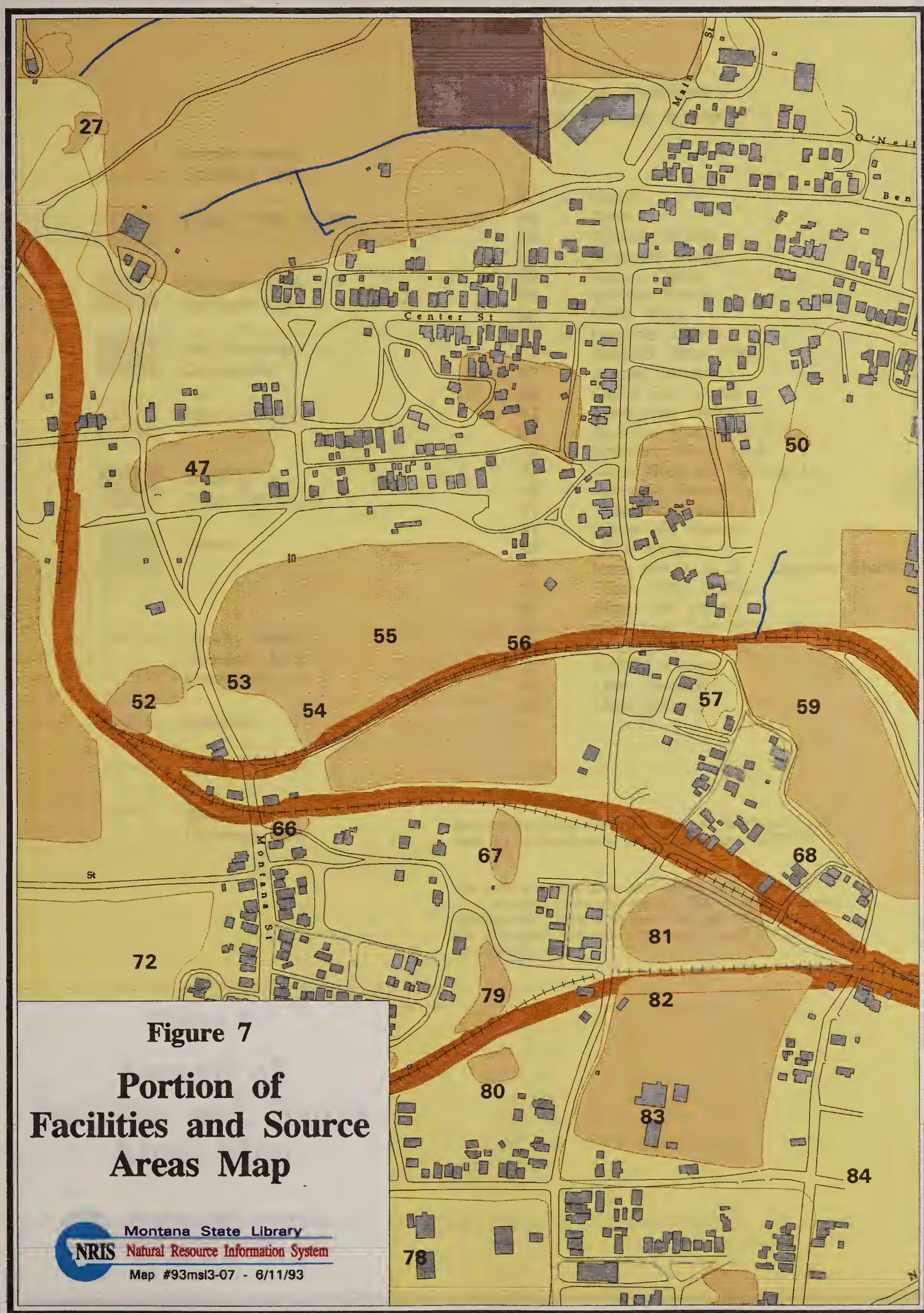

Figure 7

Portion of Facilities and Source Areas Map

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Map #93msl3-07 - 6/11/93

Priority Soils Operable Unit

Waste Rock Dump

Contaminated Railroad Bed

Mill, Smelter, or Concetrator

Open Pit Mine

Building or Other Structure

Water

Priority Soils Operable Unit Boundary

Railroad

Road

Stream or Drainage Line

List of Facilities and Source Areas

47 - Ravin
50 - Zelia
54 - Spence Dump
52 - Moscow Dump
53 - Poulin Dump
56 - Buffalo Dump
59 - Little Mina
75 - National Dump
78 - Original Mine Yard
73 - Jasper Dump
82 - Cellar Dirt Dump
81 - Clear Grit Dump
84 - Mandan Park Play Area
83 - Steward Mine Yard
80 - West Steward Parking Lot
55 - Kennedy Dump
27 - Wappello Dump
67 - Silver Hill Dump
57 - Little Mina-1
72 - New Era 1 & 2 - Downey Shafts
66 - West Ruby Dump
67 - Silver Hill Dump
60 - Mountain Con Mine Yard
76 - Waste Dump #20
77 - PA020 Dump
79 - Late Aquisition
68 - Little Mina-2

Sources: Base map data were digitized by Horizons, Inc from 1:7200 scale aerial photographs dated 4/18/1989.

The mill & smelter sites, and Priority Soils Operable Unit boundary were provided by CDM Federal Programs, Helena, MT. These data have not been validated. The boundaries are approximate, and should be used for reference only.

Figure 8

Legend of Facilities and Source Areas Map

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DATA

Photogrammetric Base Map Data

Large scale planimetric and topographic data have been developed for the Upper Clark Fork River Basin for use in the CFGIS. *Figure 9 shows a sample of the data*. *Figure 10 shows the extents of available* data, source scale, and compilation date. The data were compiled at a scale of 1:2400 - 1:6000. Features in the database include roads, trails, alleys, railroads, contours, surface water, buildings and other structures, trees, fences, wooded areas, and utility poles.

The data are stored in the CFGIS in Arc/Info format but can be translated to most computer systems capable of handling graphic data. Supported formats include Adobe Illustrator, Arc/Info export, CGM, DIME, DLG, DXF, ERDAS, IGDS, IGES, MOSS, SCITEX, TIGER, and Postscript.

1:24,000 USGS DLG Data

U.S. Geological Survey (USGS) Digital Line Graph (DLG) files for 7.5-minute USGS Quadrangle (quad) maps are available for the Upper Clark Fork River Basin. The scale for the DLG quad data is 1:24,000. Data currency ranges between 1960 and 1983. The DLG files are composed of the following data layers: Public Land Survey, Boundaries, Digital Elevation Models (DEMs), Hydrography, Roads, Railroads, and Miscellaneous Transportation. *Figure 11 shows sample 24K DLG data. Figure 12 shows the data layers available for each quad map in the Upper Clark Fork River Basin.*

1:100,000 USGS DLG Data

USGS DLG files for 30x60-minute USGS maps are available for the Upper Clark Fork River Basin. The scale for this data is 1:100,000. Data currency ranges between 1960 and 1983. The DLG files are composed of the following data layers: Public Land Survey, Boundaries, Digital Elevation Models DEMs, Hydrography, Roads, Railroads, Miscellaneous Transportation, Contours, Other Culture, Vegetation, Other Surface Features, and Control Points. The CFGIS currently has the hydrography and transportation layers for the Upper Clark Fork River Basin. *Figure 13 shows sample 100K DLG data. Figure 14 shows the data layers available for each quad map in the Upper Clark Fork River Basin.* **NOTICE - The CFGIS has re-partitioned the USGS data so that major cities are entirely within one map sheet.** *The index map in Figure 14 shows the names that we use for indexing the 100K DLG data.*

U.S. Census Bureau Demographic Data

Population data from the U.S. Census Bureau aggregated by census block are available for the entire Clark Fork River Basin. The scale for this data is 1:100,000. The information available includes total population, population above 18 years of age, population totals for White, Black, Asian, American Indian, Other, and Hispanic and Non-Hispanic, and population by race above 18 years of age. *Figure 15 shows population density in the Butte area.*

The CFGIS can obtain more extensive demographic data from the Census Bureau if it is needed by system users.

Clark Fork Data Management System Analytical Data

The Clark Fork Data Management System (CFDMS) is a component of the Clark Fork Data System (CFDS), an integrated information management system implemented for the purpose of organizing and managing the extensive data relating to the Upper Clark Fork River Basin. The CFGIS is the other component of the CFDS.

The purpose of the CFDMS is to assimilate the chemical/biological/physical data relating to the Upper Clark Fork River Basin in a data-centered, relational data management system accessible to all agencies, organizations, and individuals concerned with the river basin and its cleanup.

Data in the CFDMS can be accessed by the CFGIS for display and analysis.

Figure 16 shows arsenic levels for samples from the Draft Anaconda Soil Investigation - Phase II Data Summary Report, 1992 (CFDMS#ASMS092A) and contours generated by linear interpolation from the arsenic levels. Figure 22 shows contours derived by kriging and Figure 23 shows the 95 percent confidence surface generated by the kriging process from the same data.

TM Data

A Landsat Thematic Mapper (TM) satellite image was obtained for the entire Clark Fork Superfund area from the EPA Environmental Monitoring Systems Laboratory (EMSL). The image was classified for landtypes by the University of North Texas Institute of Applied Sciences and is from October 19, 1987. Image resolution is 30 meters. *Figure 17 is a sample of the TM data with an overlay of 24K DLG roads and hydrography* .

GIS DATA LAYERS

The following data layers are currently available at NRIS.

Statewide data:

1:2,000,000 Lakes and Streams
1:250,000 Highways
1:250,000 Township boundaries
1:250,000 Cities
1:250,000 Counties
1:250,000 Indian Reservations
1:250,000 National Parks
1:250,000 Wildlife Refuges
1:250,000 Railroads
1:250,000 Digital Elevation Model
1:250,000 Shaded Relief Rendering
1:250,000 Soils from U.S. Soil Conservation Service
1:126,720 National Forests with land ownership
1:100,000 Lakes and streams
1:100,000 U.S. Census TIGER data - roads, streams, railroads, etc.
U.S. Census Bureau Demographic Data - census blocks with population
1:100,000 Major drainage basins
1:24,000 Managed Natural Areas
1:24,000 USGS 7.5 minute quad boundaries, with names and digital data index
USGS Geographic Names Information System
Hazardous Waste Sites
Mine Locations (U.S. Bureau of Mines)
Natural Heritage Program Element Occurrences
Number of Libraries in Montana Cities
1 km digital elevation model
1 km landcover grid classified from AVHRR
Montana Department of Fish, Wildlife, and Parks administrative regions
Black bear range
EPA Ecologic Regions
Wind Energy Test Sites
Thermal Electrical Generation Sites
Hydropower Sites
NOAA Climate Stations
Soil Conservation Service Monitoring Sites
EPA STORET Sites
USGS Stream Flow Stations
USGS Groundwater Sites

Partial Statewide data:

1:250,000 Land Use from USGS
Montana Department of Fish, Wildlife, and Parks Lands
U.S. Fish and Wildlife Service Lands

Powder River Coal Region data:

1:250,000 USGS Land Use
1:250,000 fault lines
1:250,000 bedrock geology
1:250,000 coal fields
1:100,000 USGS Public Land Survey
Hydrography
Roads
Railroads
Miscellaneous Transportation
1:24,000 drainage basins
USGS stream flow stations and data
USGS surface water quality stations and data
USGS groundwater quality stations and data
USGS well log locations and data
USGS coal sample stations and data
USGS coal stratigraphy stations and data
Coal overburden chemistry
Precipitation isolines
Precipitation stations
Aquifer base altitudes and thicknesses (isolines)
Designated valley floors
Potential alluvial valley floors
100-year floodplains
Discharge permits
Abandoned mines

Helena National Forest data:

Watersheds
Landtypes

Upper Clark Fork Regionwide data:

1:100,000 USGS data: roads
railroads
miscellaneous transportation
hydrography
1:24,000 USGS data: roads
hydrography
railroads
misc. transportation
boundaries
public land survey
digital elevation models
Superfund Operable Unit boundaries
Streamside Tailings, Clark Fork River
Clark Fork Irrigation

Clark Fork Historic Irrigation
Sampled Well Sites along Clark Fork River
Sample Locations for Surveys (Clark Fork Data Management System)

Upper Clark Fork data from photogrammetry:

Regions: Milltown Reservoir, Butte, Anaconda, and
a 1,000 foot buffer along the river.
Scales: 1:2,400 to 1:6,000
Themes: roads
railroads
hydrography
buildings
contours (2-foot interval in many areas,
10-foot interval everywhere)
fences
utility poles
trees
wooded areas
spot elevations

Other Clark Fork Project Data:

Butte:
Priority Soils Operable Unit boundaries
Area 1 - Silver Bow Creek 100-year floodplain
Montana Pole Superfund Site Boundary - Butte
Superfund Lower Area 1
Butte-Silver Bow Zoning
1980 Census Group Population Data
1980 Census Geography
Contaminant Source Areas
Ore concentrate spill site
Additional waste rock dumps
Faults and veins
Surface Geology
Names of places, landmarks, etc.
Drainage basin of Grove Gulch Creek
Storm sewer drainage basins
Surface Drainage area of the Berkeley Pit
Underground Drainage area of the Berkeley Pit
Schools and Play Areas
Open Pit Mines
Waste Dumps, Ponds, and Reclaimed Land
Land Use
Mill Sites
Reclaimed Areas
Mine Shafts
Roads

1991 ARCO Surface Land Ownership
1991 Surface Ownership Other than ARCO
1986 Surface Mining Claims
Railroad Bed Sample Points, Metal Concentrations
1987 Soil Screening Samples
Concentrate spill site Soil Samples
Groundwater Metal Concentrations
Shallow well Metal Concentrations
Images of 1:16,000 scale air photos

Smelter Hill (Anaconda):
Flue Dust Sites
Drainage basins
Vegetation type
Gullies
Eroded areas

Opportunity Ponds/Deer Lodge Valley:
Phytotoxicity stations
Dikes
Roads
Wells
Area of aerial deposition of Arsenic

Anaconda:
Land use
Roads
Image of aerial photo

Milltown:
Milltown Reservoir 1978 Shoreline
Wetlands and Uplands
Downstream Sample Sites
Abandoned Railroad Bed
Wetland and Deepwater Habitats

Blackfoot River Basin Data:

Main Stem Blackfoot River
EPA Eco Regions (Omernik, 1987)
Sub-watershed boundaries
1989 Canyon Creek fire boundary
Helena NF Wilderness Soils
Helena NF Soils
Lolo NF Landtype
Missoula County Soils
Riparian Areas and Macrophyte Areas (from 1987-88 aerial photos)
Hydrography
Railroads

Figure 9 - Large Scale Photogrammetric Data

One inch = 200 feet
Contour Inverval 2 feet

Figure 10

Index to Large Scale Photogrammetric Data

10
11
12
14
15
13
18
24
19

Figure 11 - USGS 1:24,000 Scale Data

One inch = 2000 feet

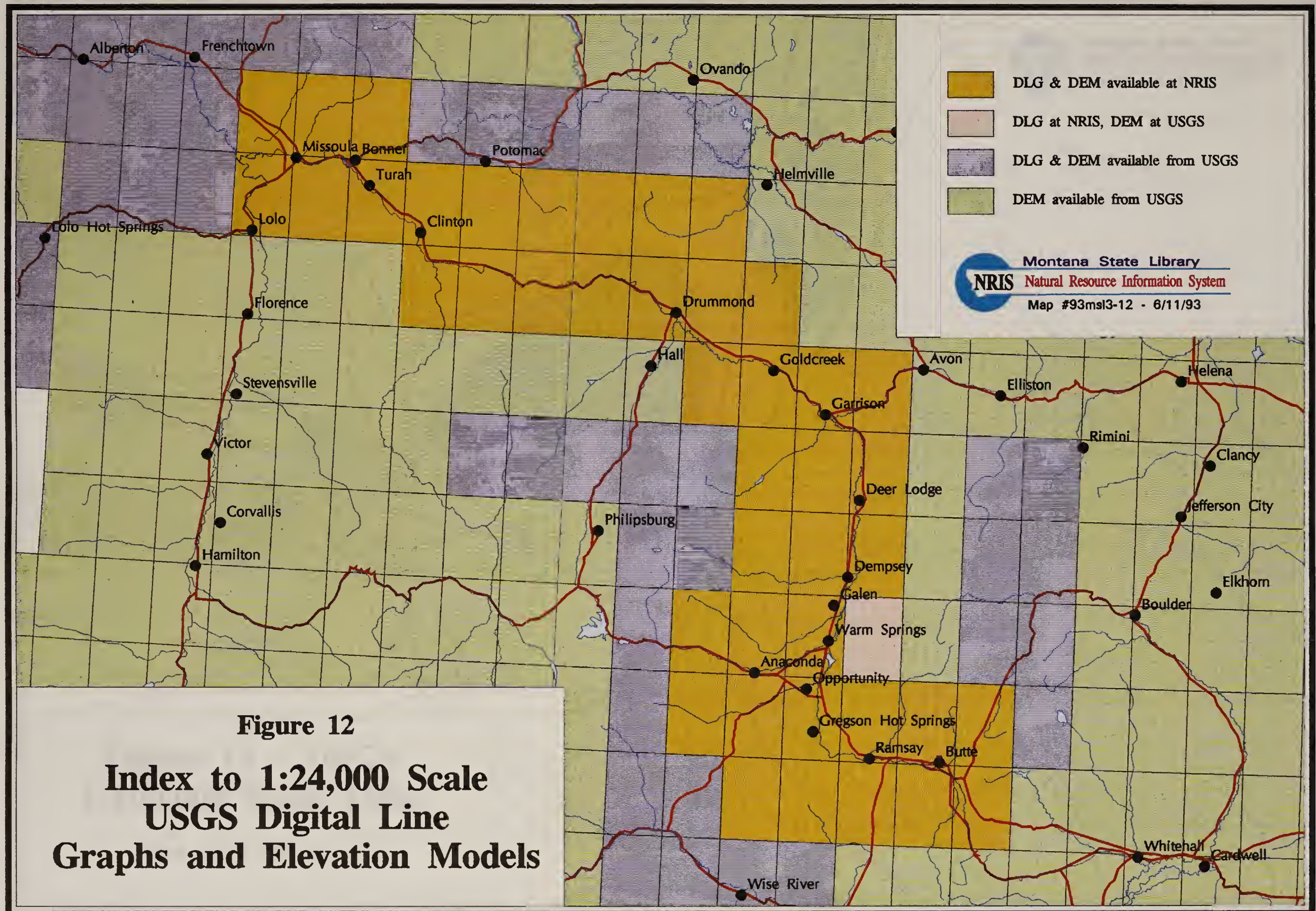

Figure 12

Index to 1:24,000 Scale USGS Digital Line Graphs and Elevation Models

Figure 13 - USGS 1:100,000 Scale Data

One inch = 1.58 miles

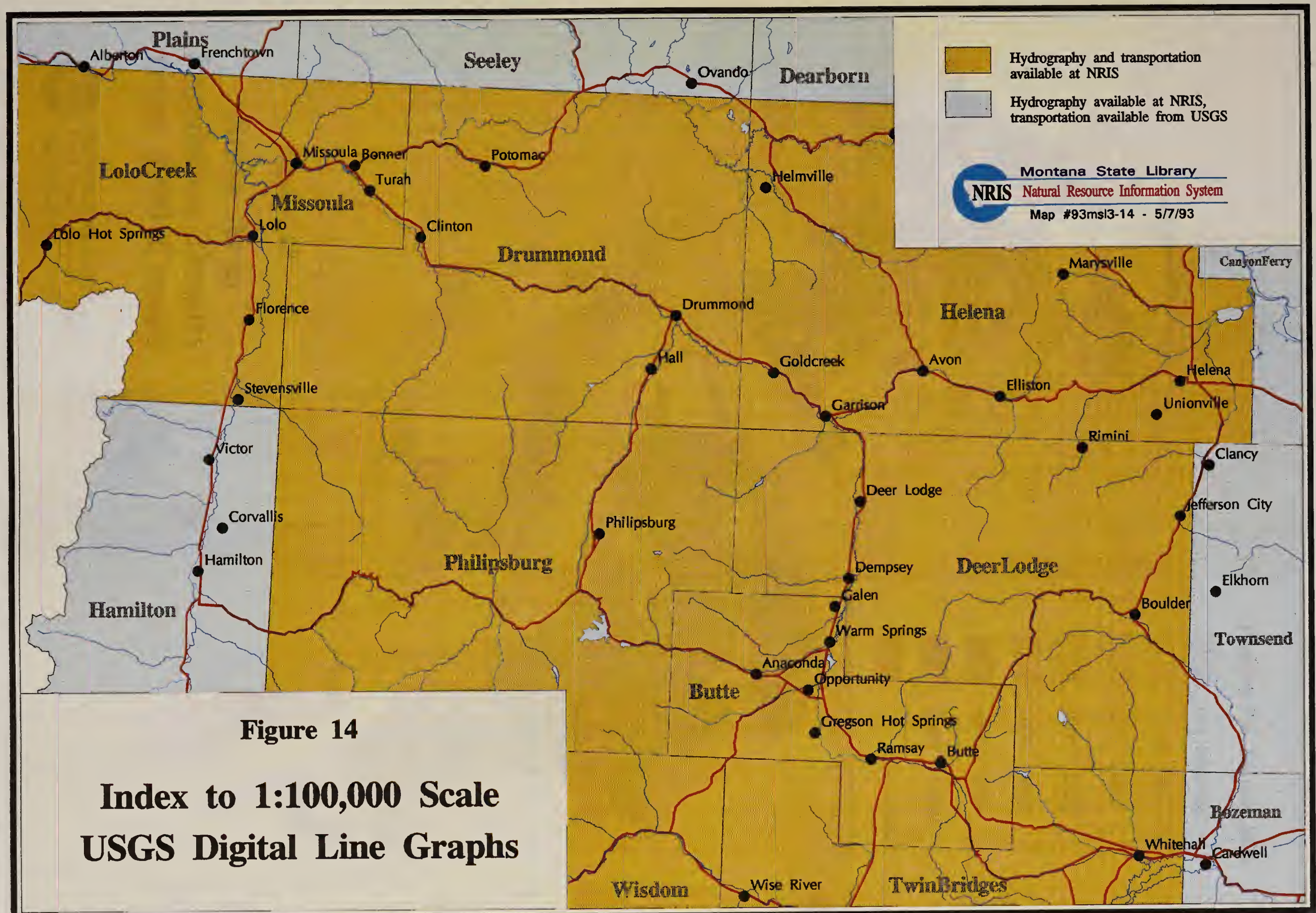

Figure 14

Index to 1:100,000 Scale USGS Digital Line Graphs

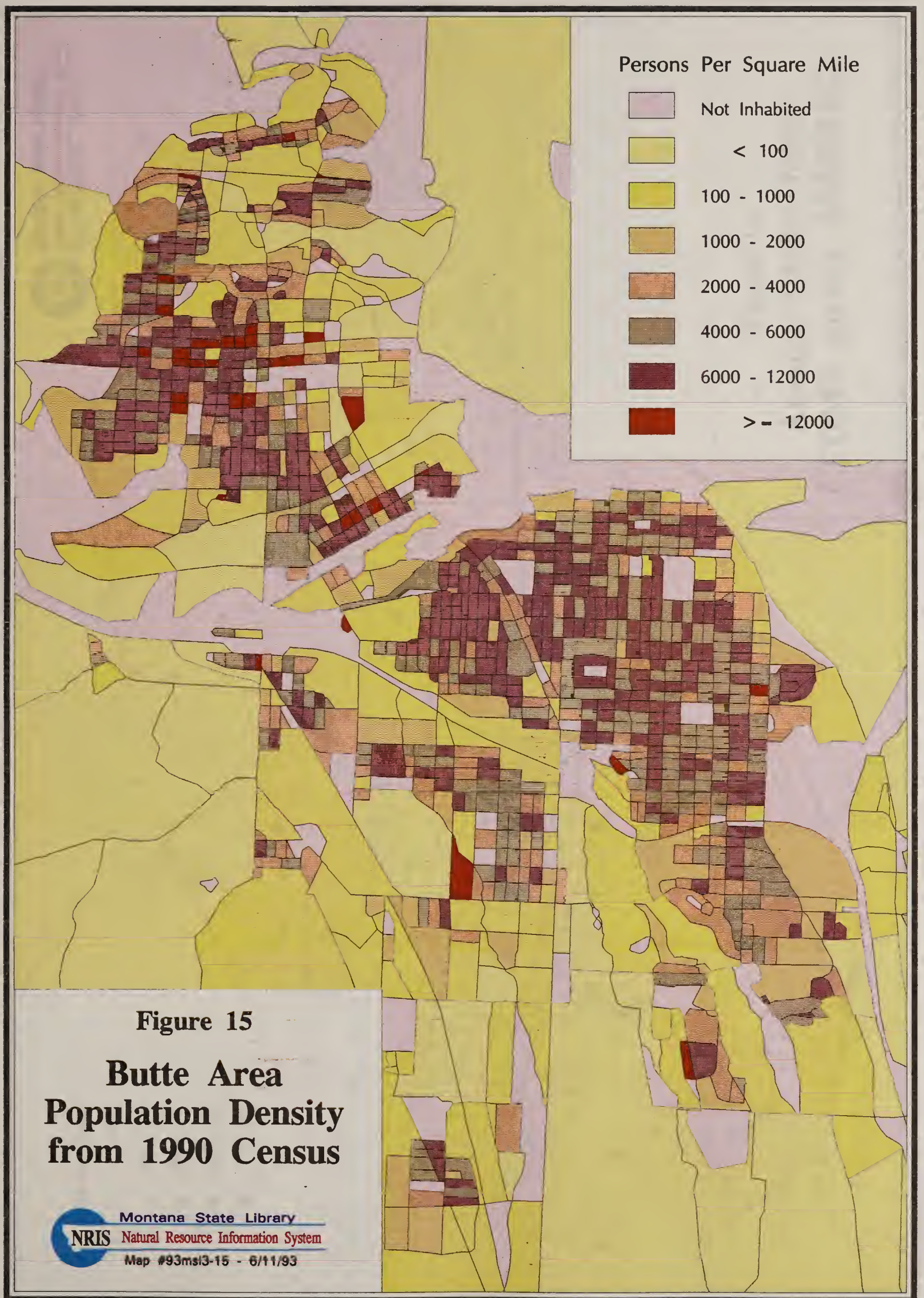

Figure 15

Butte Area Population Density from 1990 Census

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Map #93msl3-15 - 6/11/93

Arsenic (ppm)

- < 150
- 150 - 250
- 250 - 350
- 350 - 550
- >= 550

Figure 16

Arsenic Levels from CFDMS survey ASMSO92a

Anaconda

Cropland
Irrigated Pasture
Pasture
Range
Shrub/Mixed
Evergreen Forest
Other Trees
Water
Barren
Tailings

Figure 17 - Classified Landsat Thematic Mapper Image

SOFTWARE

Arc/Info

The CFGIS uses Arc/Info GIS software, developed by the Environmental Systems Research Institute, Inc. (ESRI), as its primary tool for processing spatial data. ESRI is a recognized leader in the GIS field and Arc/Info is noted for its flexibility and extensive functionality. The CFGIS has the core Arc/Info software as well as the TIN, GRID, and Network sub-modules. CFGIS staff are fully trained and have extensive experience using Arc/Info.

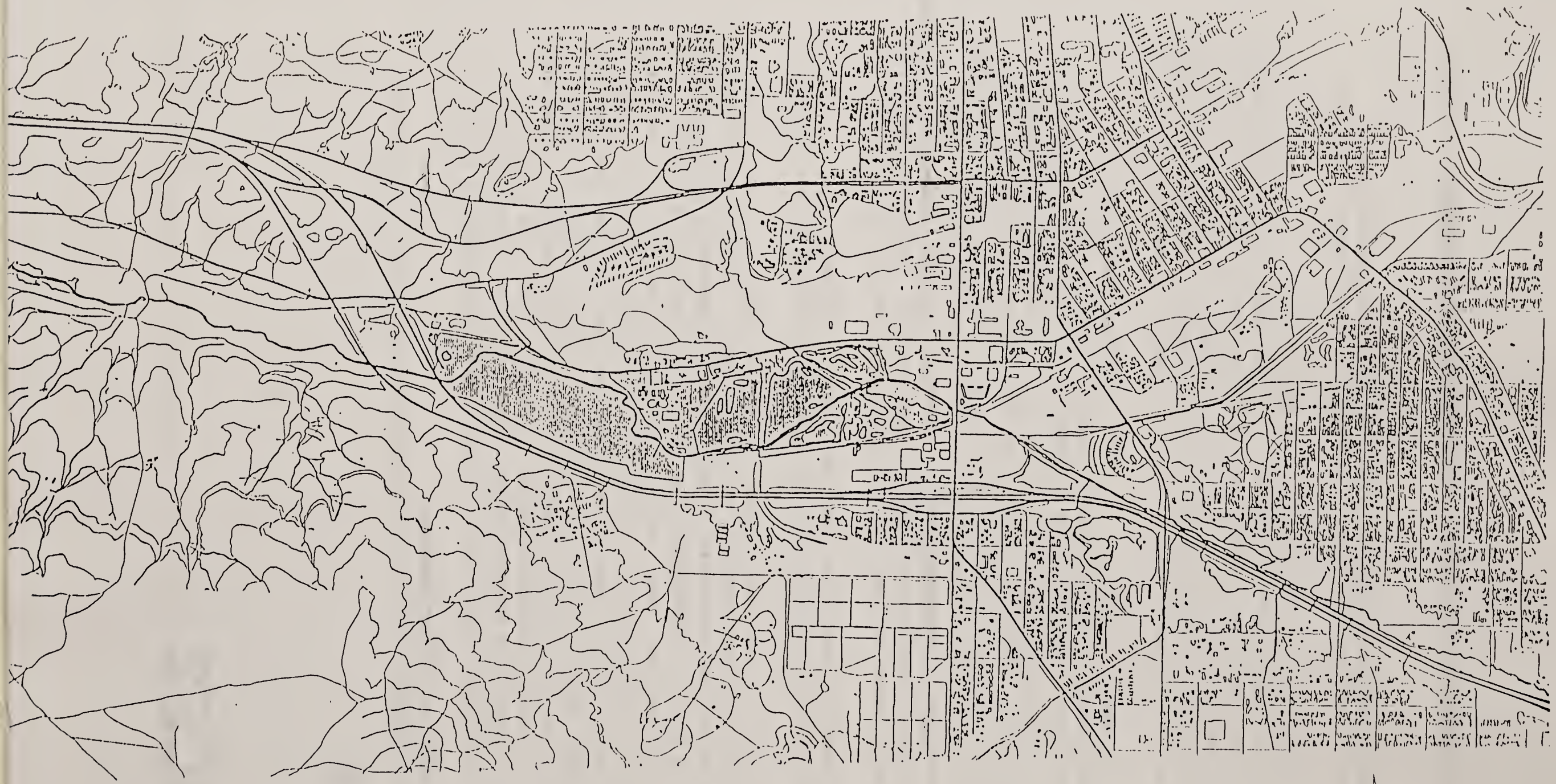
ArcView

Existing GIS data sets are available for ARCO, EPA, BUTTE/SILVER BOW, and DHES use though a GIS interface called ArcView. ArcView is a "simplified GIS." While it has limited capabilities in terms of spatial analysis, it is very easy to display and query spatial data, and is much more user-friendly than a conventional GIS package. Most queries performed using ArcView may be accomplished by pointing the cursor on an icon and clicking the mouse button.

By using ArcView, project managers can access and perform simple queries on data developed for the Upper Clark Fork Superfund area from their desktops. ArcView also allows plotting of maps and creation of files of attribute information that can be loaded into word processing, spreadsheet, and data management systems.

Figure 18 was created using ArcView.

Montana Natural Resource Information System



Lower Area One

ArcView Sample Map

Contours (50' Intervals)

Water Features

Buildings

USGS Roads
- Primary
- Secondary

Lower Area One

FIGURE 18

SERVICES

Data Analysis

With the hardware,software, data, and staff resources available to CFGIS users, extensive spatial data analysis are possible.

Using Digital Elevation Model (DEM) data, modeling of surface features can be performed with GIS. **Viewshed analysis** is one of these surface modeling tools. Viewsheds can be developed from two distinct points of view. One point, an internal view, looks from the point of interest out to the surroundings. The other, an external view, looks from the surroundings into the point of interest. These viewsheds can answer questions from a spatial perspective, such as, "where can we see this from?" or "by whom can it be seen?" Viewsheds can also answer quantitative questions such as, "how much of the development area can be seen?" or "how much of the surrounding area is seen from the development area?" Through the answers to these and other questions, visual value can be enhanced or maintained to the benefit of the area and the development. *Figure 19 shows all the areas that can be seen from an observation point on Interstate 15 near Elk Park.*

DEM data can also be used to quantify and display percent slope as illustrated in Figure 20 and to develop shaded relief maps as shown in Figure 21.

The CFGIS has a wide variety of analytical capabilities. One type of analysis performed with the GIS is surface interpolation using **kriging**. Kriging is a method for interpolating a surface from point values. A procedure similar to multiple regression is used to fit a "trend surface" to the data. A second surface that describes the statistical confidence for the value of each point on the interpolated surface is also generated. *Figure 22 shows a surface of arsenic concentrations developed using kriging techniques. Figure 23 shows a 95 percent confidence surface in parts per million.* These figures are based on samples from the Draft Anaconda Soil Investigation - Phase II Data Summary Report, 1992 (CFDMS#ASMS092a) and are intended to illustrate system capabilities only.

One of the strongest capabilities of GIS is the built-in index all data have by virtue of its locational component. One application that can take advantage of this spatial index is **proximity analysis**. Proximity analysis is the determination of the distance between objects or the quantity of objects within a specified distance. An example of proximity analysis would be the determination of how many soil samples from a given survey were taken within 100 feet of Silver Bow Creek.

There are many other analytical applications possible with the CFGIS. Contact a CFGIS staff member at (406) 444-5354 if you have any questions or ideas.

Training

Training in the basics of GIS, various features of ArcInfo, ArcView, and other topics is available upon request. Additionally, NRIS periodically sponsors seminars on various GIS topics. These 2-hour seminars usually focus on a specific project. Contact NRIS for a schedule of upcoming seminars. NRIS also participates in the annual Montana GIS Users Conference which provides educational opportunities from entry level to advanced GIS.

Technical Consultation

CFGIS staff provide consulting in most areas of GIS including recommendations on potential applications, database design, hardware configuration, networking, and project setup and design.

Custom Programming

CFGIS staff can provide custom programming to solve a wide variety of GIS and data processing needs. This programming can range from the development of custom user interfaces, converting data between various formats, report generation, data analysis, development of productivity tools, and others.

Custom Map Design

Traditionally one of the primary services the CFGIS has provided is the design of custom cartographic products. The vast amount of data available, staff expertise, and the advanced hardware environment allow the development of high-quality map products for reports, public display, and analysis.

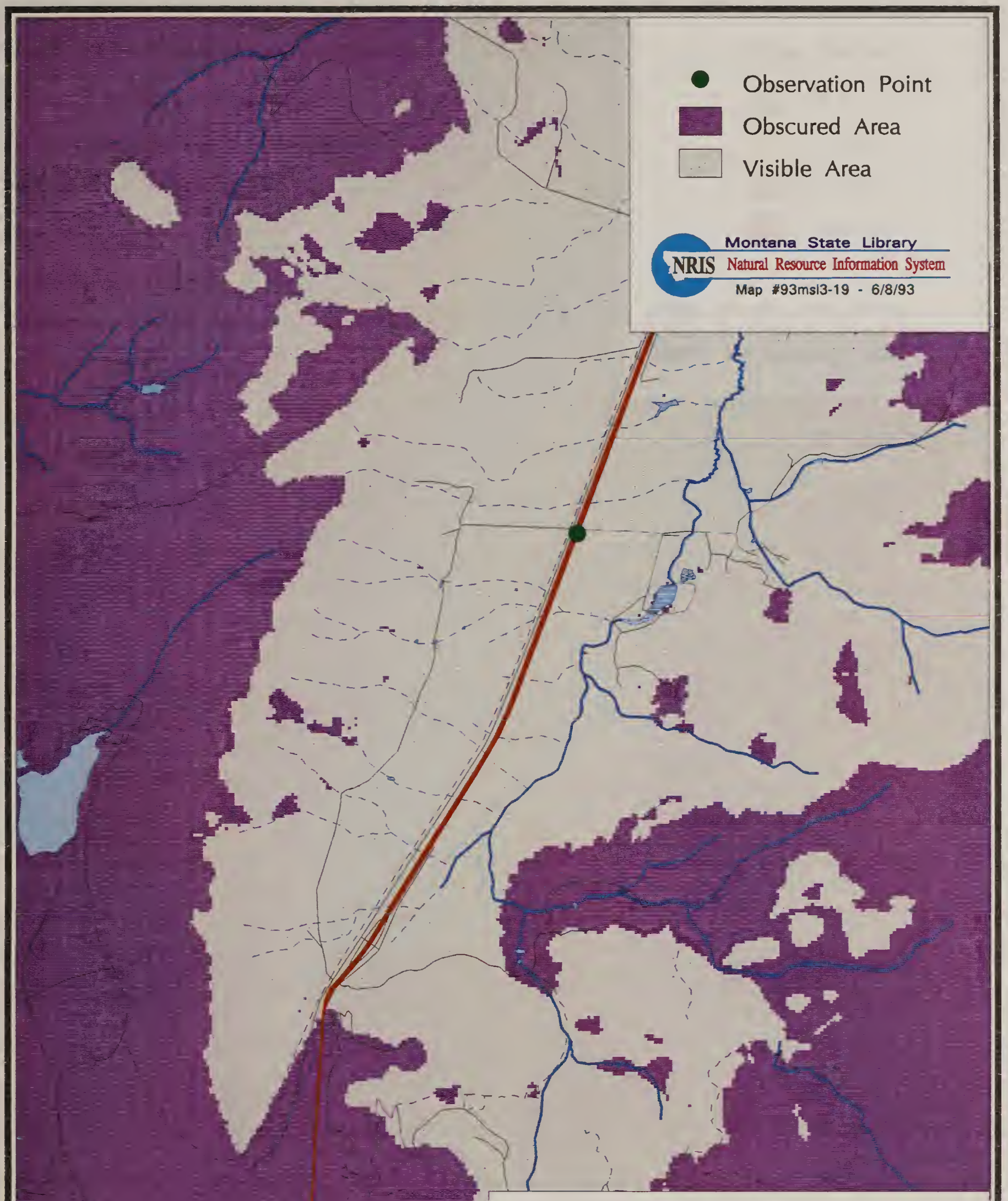


Figure 19

Elk Park Quadrangle Visibility Map from USGS 7.5 Minute DEM

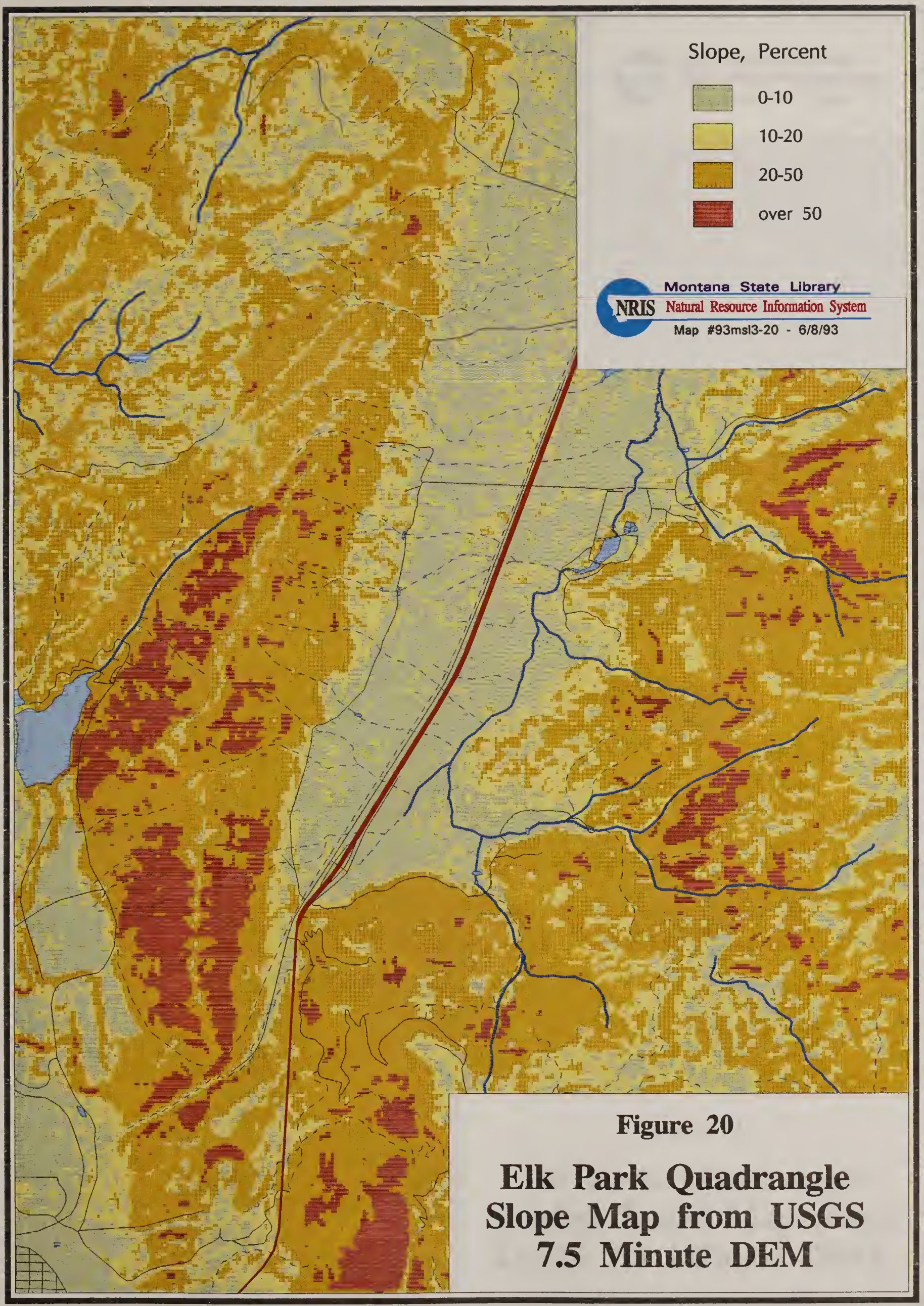


Figure 20

Elk Park Quadrangle Slope Map from USGS 7.5 Minute DEM

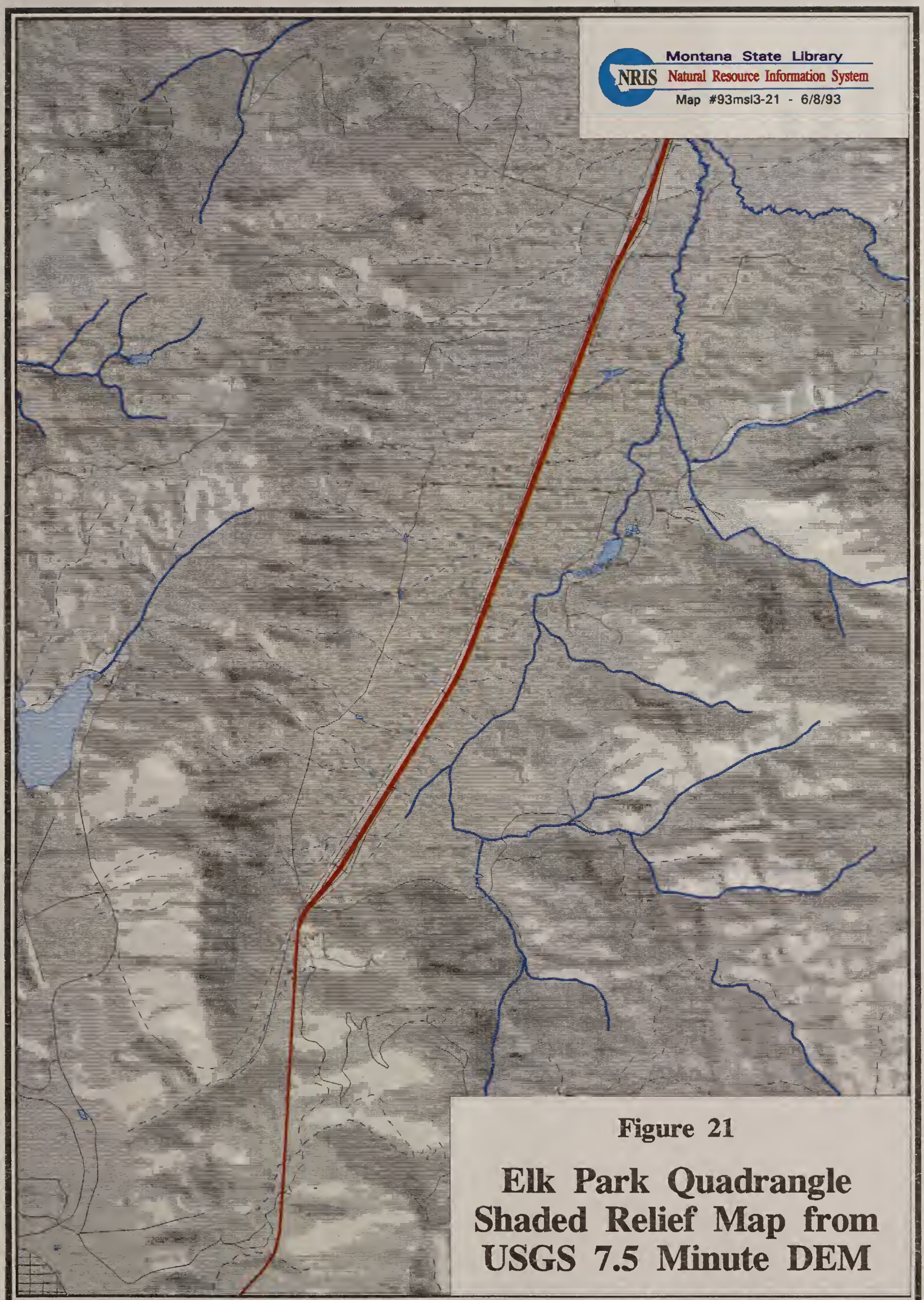


Figure 21

Elk Park Quadrangle Shaded Relief Map from USGS 7.5 Minute DEM

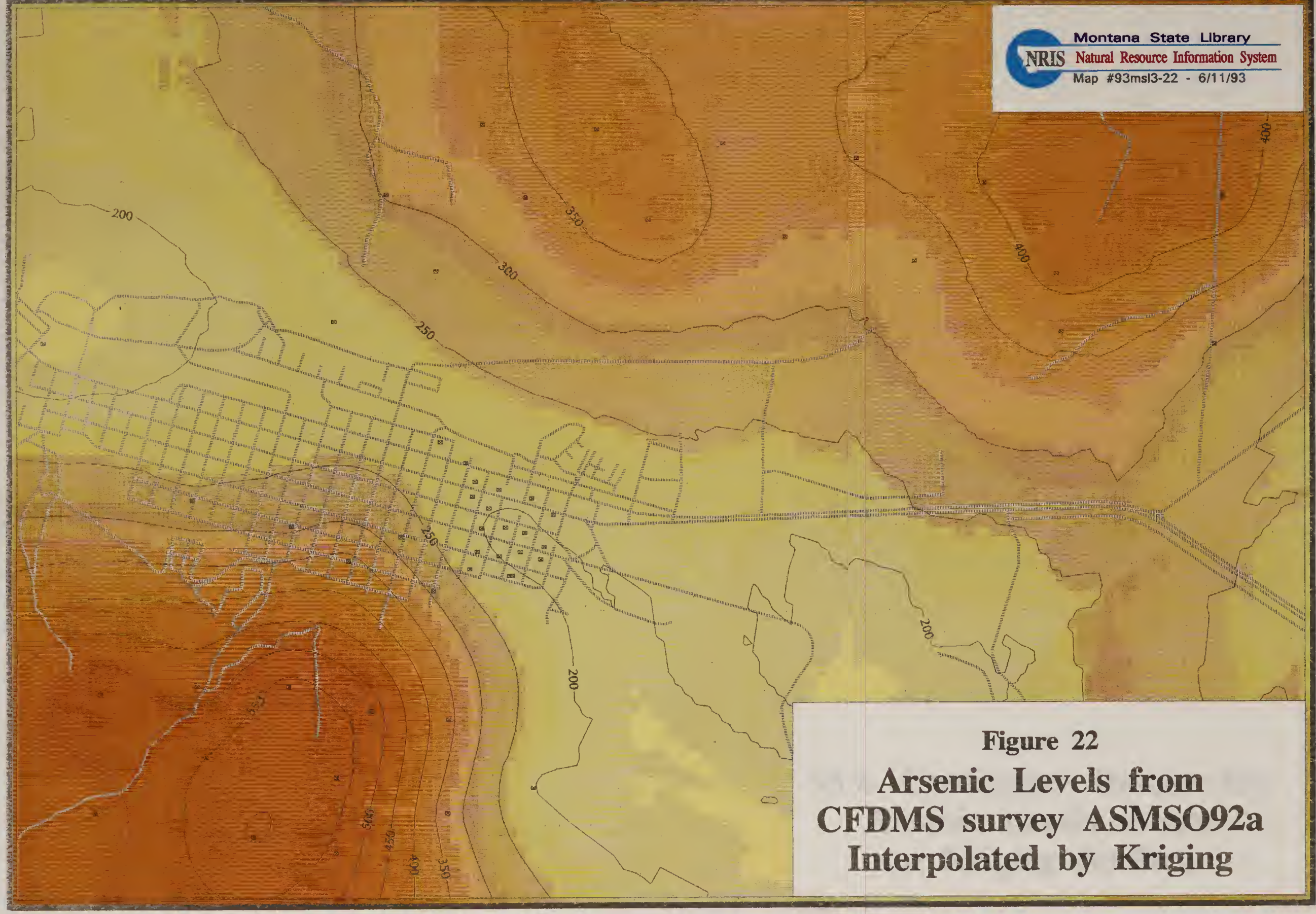


Figure 22

Arsenic Levels from CFDMS survey ASMSO92a Interpolated by Kriging

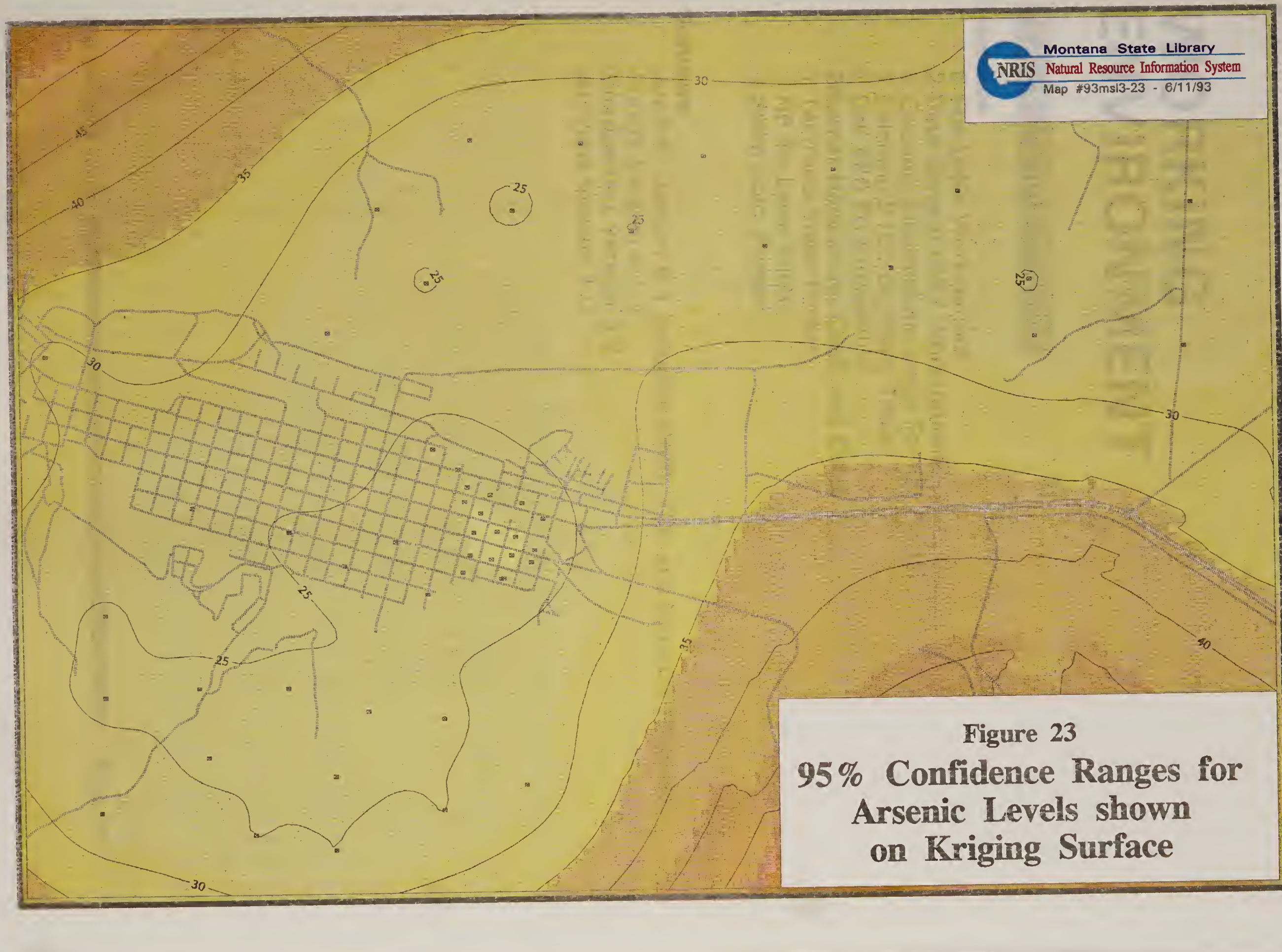


Figure 23

95% Confidence Ranges for Arsenic Levels shown on Kriging Surface

WORKING ENVIRONMENT

Hardware and Software

Hardware

6 Sun UNIX Workstations
2 Data General UNIX Workstations
1 Calcomp Electrostatic Large Format Plotter
1 Calcomp 9100 Digitizing Table
1 Dell 486 PC Compatible
Ethernet Networking Cards and Cable
1 Tektronix Inkjet Printer
1 HP IIIs Laser Printer
1 Seiko Color Printer

Software

Arc/Info Version 6.1 including GRID, TIN, and Network Modules
SunOS Version 4.1.3
Wordperfect Version 5.2
ArcView Version 1.0

Montana Natural Resource Information System

SPARCstation IPC 'barney'

SPARCstation 2 'sara'

CD-ROM
1/4" tape
8mm tape
1.3 Gb disk

DEC PC 'lucky'

Calcomp 68436 Electrostatic Plotter

CD-ROM
1/4" tape
1.0 Gb disk
8mm tape

Aviion 412 'george'

Calcomp 9500 Digitizer

SPARCstation 2 'floyd'

SPARCstation 2 'clara'

CD-ROM
1/4" tape
8mm tape
1.3 Gb disk

Dell PC 'pedro'

HP LaserJet IIIsi Printer

9-trak tape

SPARCstation 2 'bea'

SPARCstation 2 'opie'

1.3 Gb disk

Dell PC 'stimpy'

Dell PC 'otis'

CD-ROM
1/4" tape
1.0 Gb disk
8mm tape

Aviion 412 'wilma'

Conference Room

Figure 24 - NRIS Computer Network

Montana State Library
NRIS Natural Resource Information System

Map #93msl3-24 - 6/8/93

SYSTEM ACCESS

Clark Fork Data System Use Guidelines

March 3, 1992

EPA discontinued funding of the Clark Fork Data System as of October 1, 1991. As of September 23, 1991, ARCO began funding the System. Due to the change in funding source, access guidelines have changed. This document was prepared by MDHES to provide access and use guidance to agency personnel. Provisions regarding use of the System can be found in two documents: the Memorandum of Agreement between MDHES and ARCO through which funding is provided; and the Clark Fork Data System Project Plan, Chapter 5, Access Guidelines. These provisions are summarized below:

General Access and Use Limitations

Services and products are available to all users through data system staff.

Direct (hands on) access is available to the State, EPA, and ARCO and their respective consultants or contractors. Direct access by others is available on approval of the data system steering committee.

ARCO Funding Limitations

Access to the system, services and products will be provided through ARCO funding to the State, EPA, ARCO, and their respective consultants and contractors for any purpose which is necessary to facilitate the Superfund process on the Clark Fork Superfund sites. This is true even in the case where ARCO is not the only Potentially Responsible Party (PRP) for a site and the access, services, and products relate to the involvement of other PRPs.

Access, services, and products will not be provided at ARCO's expense to other PRPs, individuals, or organizations directly or through EPA and State project personnel unless authorized by ARCO. This restriction does not apply to simple and routine data queries that can be handled in less than one hour so long as the users are directly associated with the Clark Fork Superfund sites.

ARCO has fully funded the installation and maintenance of data system computer equipment and will allow use by others if that use does not interfere with State, EPA, and ARCO use for the Clark Fork Superfund process. Charges for use not funded by ARCO will generally be limited to personnel time and materials used; however, frequent or heavy users may be expected to defray a portion of equipment and maintenance charges.

Confidentiality

All access, services, and products funded by ARCO (i.e., not charged directly to the user) will be reported to ARCO in the form of quarterly reports, summarizing activities for the previous quarter by site, users, and tasks. Unless otherwise advised, data system staff will assume that the fact that services and products have been requested, the status of those services and products, and the products themselves are not confidential. Access, services, and products funded by ARCO cannot be kept confidential from ARCO or the State.

Access funded through other sources will not be reported to ARCO except to note the percentage of system use by non-ARCO funded users. Products will not be kept confidential unless requested.

All data stored on the ARCO funded system will be made available without restriction to the State, EPA, and ARCO and their respective consultants and contractors. Data will not be released to other users until the data validation procedures set forth in the associated documentation are completed, except at the discretion of the EPA RPM or MDHES SPO.

Confidentiality requests will be handled on a case-by-case basis to determine the need for segregation of data on non-ARCO funded equipment, removal of products from the system after completion, and other considerations.

Charging System for NRIS/Heritage

NRIS strives to make data available in as easy and meaningful way as possible to system users. Most requests can be filled with a single phone call. To place a request or obtain further information about system capabilities call (406) 444-5354.

As a program of the Montana State Library NRIS adheres to state law for providing access to data. Following is the primary state law affecting NRIS data distribution:

90-15-304. AVAILABILITY OF INFORMATION. (1) Except as provided in subsection (3), the library shall make information from the natural resource information system available to local, state, and federal agencies and to the general public.
(2) The library may establish a fee system for information requests in order to cover the costs of providing requested information.
(3) If necessary, the library shall establish procedures to protect confidential information in the possession of state agencies.

Custom Services

In addition to providing access to data, NRIS can provide an increased level of data processing services under contract with state and federal agencies. See Products and Services sections for a complete list of available services.

Data Access Fee Structure for Private Users

NRIS and the Montana Natural Heritage Program (NHP) will charge a fee to private users of the data and services in an effort to recover the service cost incurred for staff time and other expenses.

Fee Structure:

Basic Charge:	$30.00 Access Fee per request Includes one hour of data manager's time to clarify data need with user, conduct computer search and retrieval, quality assurance, and assembling and mailing completed data request, etc.
Materials Charge:	$0.25/page of computer printout $5.00/floppy disk
Staff Charge:	$25.00 per hour, rounded to the nearest half-hour Applies to data analysis, manual searches and map interpretations, technical assistance in defining needs, preparing special reports with the data, etc. (for staff time beyond one hour included with basic charge)

Exemptions and Related Policies:

1) Charges only apply to private users of the NRIS/Heritage program. Private users are defined as "Any business, entity, or individual using, directly or indirectly, the data and services as part of a potential for-profit activity."
2) No charges to government agencies, non-profit organizations, contractors and consultants on retainer to government agencies, or members of the general public.
3) The NRIS Director reserves the right to waive user charges when a data request requires less than one hour of response time and no data is provided relevant to user's request.
4) Invoices submitted with responses; payable in 30 days.
5) All revenue is deposited into appropriate grant/contract accounts.

FOR MORE INFORMATION ABOUT THE USER FEE POLICIES, CONTACT ALLAN COX, NRIS DIRECTOR (406)444-5355, MONTANA STATE LIBRARY, HELENA, MT 59620.